



Digital Cultural Heritage di Metaverse

Dr. Surya Sumpeno

PERKENALAN



Dr. Surya Sumpeno S.T. M.Sc.
Human Centric System Workshop

- Sensors
- Interaction Devices
- Virtual Reality (VR)
- Mixed Reality (MR)
- Augmented Reality (AR)
- Dunia Virtual, Digital World, Digital Twin
- Artificial Intellegence
- **“Realize creative economy & happiness of the people through ICT”**
 - Dept Teknik Komputer
 - Fakultas Teknologi Elektro dan Informatika Cerdas



Pengantar Metaverse

- The metaverse can be defined as
 - a simulated digital environment that uses augmented reality (AR), virtual reality (VR) → eXtended Reality,
 - and blockchain, along with concepts from social media, to create spaces for rich user interaction mimicking the real world
 - Non Fungible Token (NFT)
 - Gozali Satu Milyar
- Contoh:
 - film Ready Player One
 - Sosial media saat ini, namun dengan cara interaksi yang lebih terintegrasi dan tenggelam-larut (immersive)
 - Facebook di-rebrand sebagai Meta
 - Facebook's metaverse is yet to exist. When it does, it will be accessible via VR headsets, augmented reality smart glasses like Ray-Ban Stories, and on desktop and mobile apps in a limited way.



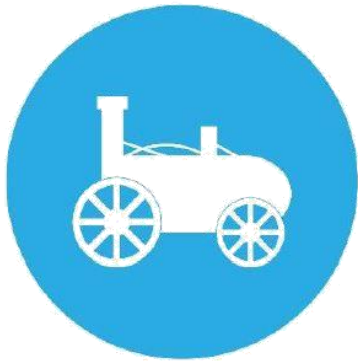
Implikasi dari Metaverse

- In addition to two-dimensional digital spaces, users will now have an immersive reality that they can occasionally inhabit.
- **Content creators and designers (especially 3D modelling and VR world-building experts)** can expect new opportunities on the road ahead.
- The metaverse opens up a **new economy** where wealth can be created, traded, and enhanced using a currency distinct from but related to the real world.
 - **Contohnya: NFT, Gozali Everyday**
- The metaverse necessitates the evolution of new technologies for its execution. For example, you need a “**Digital me**” or the **digital twin** of a person to simulate real-world presence.
- There are concerns around data privacy, security, diversity, and ethical behaviour – problems of the real world that may take on a new dimension in a virtual one.

Revolusi Industri 4.0 dan Digital Migrant Generasi Milenial, Gen C, Youtube, 3D VR Metaverse

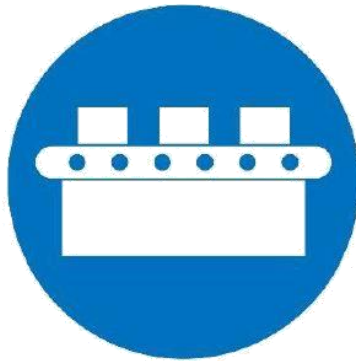
... INDUSTRIAL REVOLUTION ...

1st revolution



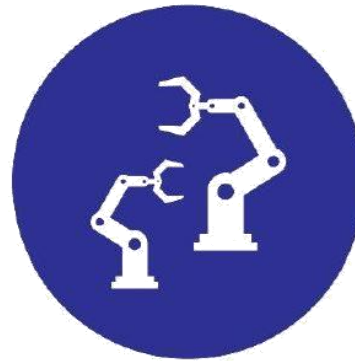
Mechanization, steam
and water power

2nd revolution



Mass production and
electricity

3rd revolution



Electronic and IT
systems, automation

4th revolution



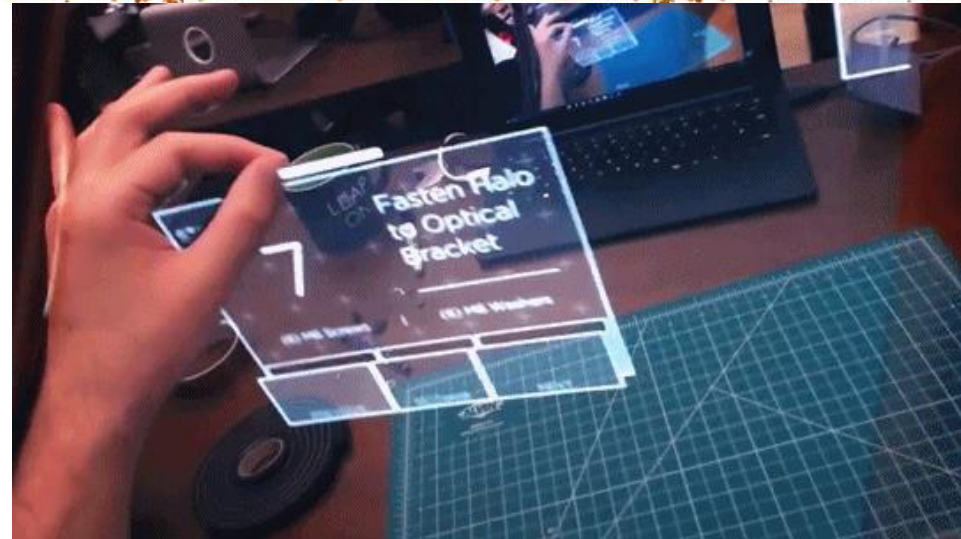
Metaverse

Cyber Physical
System, Internet of
Things & Bio-
technology

Masyarakat yang Hidup dalam eXtended Reality



- Definisi
 - **Realitas yang diperluas**
 - **Memanfaatkan dunia virtual untuk memperluas jangkauan, melakukan percepatan langkah, jejaring, melakukan hal-hal yang dulu mustahil dikerjakan**
- Manusia masa depan hidup paralel di Metaverse
- Meliputi VR, AR dan MR (dan bentuk-bentuk lainnya)
- XR is a superset which includes the entire spectrum from "the complete real" to "the complete virtual" in the concept of reality-virtuality continuum introduced by Paul Milgram. Still, its connotation lies in the extension of human experiences especially relating to the senses of existence (represented by VR) and the acquisition of cognition (represented by AR). With the continuous development in human-computer interactions, this connotation is still evolving.
- XR is a rapid growing field being applied in a wide range of ways, such as entertainment, marketing, real-estate, training and remote work.



Metaverse in Cultural Heritage

- ❑ **Digital Native** versus Digital Migrant [Marc Prensky, 2001]
- ❑ Preservation, Presentation, Interaction
 - 3D Reconstruction, 3D Presentation (now popular as 3D Cinemas/Movies), Virtual Reality (VR) dan Augmented Reality (AR) → eXtended Reality (XR)**
- ❑ Metaverse for Digital Native
 - ❑ **VR/AR Gadget**
 - ❑ **Smartphone, Gadget**
 - ❑ **New Interpretation**
 - ❑ **New Representation**
 - ❑ **Dynamic not Static**

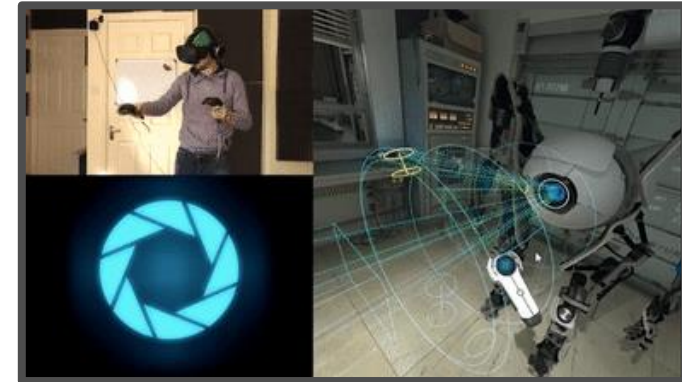
Girl with a Pearl Earring
Artist Johannes Vermeer
Year c. 1665
Medium Oil on canvas
Location Mauritshuis, The Hague, Netherlands



Virtual Reality (VR)



- ❑ VR atau Realitas Maya dapat digunakan sebagai terminology payung untuk menjelaskan teknologi-teknologi yang serupa walau tak sama, dalam interaksi seorang pengguna (user), pemain (player) dengan dunia virtual/maya.
- ❑ VR secara utuh bersifat imersif atau menenggelamkan (immersed) pengguna ke dunia lain. Seseorang bisa merasa berada di pegunungan yang tinggi memandangi lembah, kawah, jurang atau sebuah laboratorium membongkar-bongkar isi sebuah mesin, padahal secara actual ia sedang duduk di sebuah ruang ber-AC.
- ❑ Cara umumnya adalah dengan mengganti masukan ke pengindra (sensor) pengguna dengan masukan yang lain.
- ❑ Pengindra utama manusia adalah mata yang memperoleh sensasi visual. Untuk mendapatkan persepsi 3D dan riil, ada bermacam cara. Lazimnya adalah menggunakan Head Mounted Display (HMD) atau headset (sekalian dengan sensasi/persepsi audio ke pengindra dengar atau telinga).
- ❑ Citra dan suara yang dibangkitkan oleh PC atau perangkat inilah yang akan di-indra oleh pengguna sehingga memperoleh sensasi berada di dunia yang lain, bukan di dunia di mana ia sekarang berada.
- ❑ Interaksi dengan benda-benda virtual atau lingkungan virtual lalu dilakukan dengan bantuan perangkat interaksi seperti sensor orientasi (giroskop atau kompas), pengindra gestur tangan, atau klik peranti tertentu.



Perangkat VR populer antara lain HTC Vive, Oculus Rift, Samsung Galaxy Gear VR atau Google Cardboard. Harganya bervariasi dengan kualitas yang beragam pula.



**HMD Stereoskopik VR 3D
dengan
Pengindra Visual Gesture
Jari Tangan**



**HMD VR 3D dengan
Pengindra Flex**

Interaksi Hand Gesture Low Cost VR HMD Garudeya



Aplikasi Eksplorasi Benda-benda Bersejarah
dengan Leluasa dan Detil i.e. eksplorasi Garudeya

Immersion di Metaverse Virtual World



Simulator mengendarai mobil dengan hembusan angin dan kemiringan



Simulator pilot pesawat terbang



Simulator operasi pelabuhan dan kapal



Simulator militer

Representasi di Dunia Virtual Metaverse



Lingkungan Virtual → Digital Twin)

- ❑ Panoramik untuk pandangan jarak jauh di dalam VR atau 360. Terminologi: VR photograph (VR photo), 360-degree photo, photo sphere, spherical photo, interactive panorama, immersive panorama. Player berada di dalam silinder (tong virtual).
- ❑ Lingkungan Virtual sebagai rekonstruksi dari Lingkungan Asli, 3D Scanner lingkungan virtual
- ❑ Tempat meletakkan benda-benda digital



Pemandangan Panorama yang biasa dilihat pengguna dengan menengok kiri kanan melalui HMD. Sensor terpasang di HMD yang mungkin menangani adalah giroskop, akselerometer dan magnetometer (kompas). Ketiganya dapat berperan untuk arah/orientasi dan gerakan kepala pengguna.

Benda digital virtual → Digital Twin

- ❑ Rekonstruksi dari benda nyata
 - ❑ **Scanner 3D, Fotogrammetry**
- ❑ Pemahat 3D, Pemodel 3D untuk menghaluskan
- ❑ Property dari benda virtual: Visual dan Fisik
 - ❑ Adopsi (penyerupaan) dari benda nyata



Non Fungible Token (NFT)



- NFTs are unique cryptographic tokens that exist on a blockchain and cannot be replicated.
- NFTs can be used to represent real-world items like artwork and real-estate.
- "Tokenizing" these real-world tangible assets allows them to be bought, sold, and traded more efficiently while reducing the probability of fraud.
- NFTs can also be used to represent individuals' identities, property rights, and more.
- The distinct construction of each NFT has the potential for several use cases. For example, they are an ideal vehicle to digitally represent physical assets like real estate and artwork.
- Much of the current market for NFTs is centered around collectibles, such as digital artwork, sports cards, and rarities.

Digital Twin, Replika, Perupa Digital, Creator, NFT Metaverse

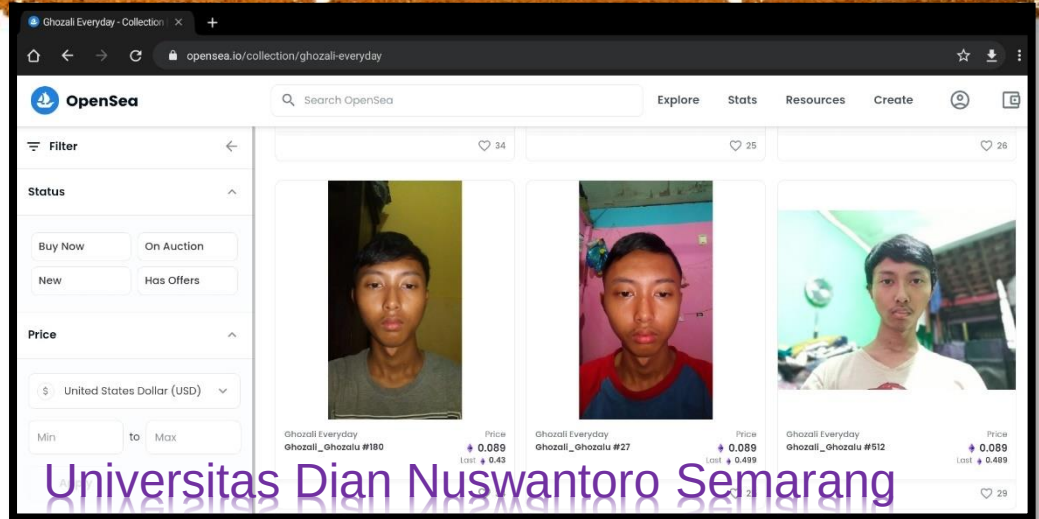
BREAKING | Jan 25, 2022, 12:10pm EST | 3,310 views

YouTube Considers Adding NFTs As A Revenue Source For Creators



Lisa Kim Forbes Staff
Business

Follow



Alhamdulillah seminggu bisa laku 4 NFT Moemiow dgn price range 0.01 - 0.03 ETH

Terima kasih buat 4 kolektor semoga diliimpahkan kesehatan dan kemudahan rejeki. Harga NFT artinya naik berkali-kali lipat di kemudia hari. Aamiin.

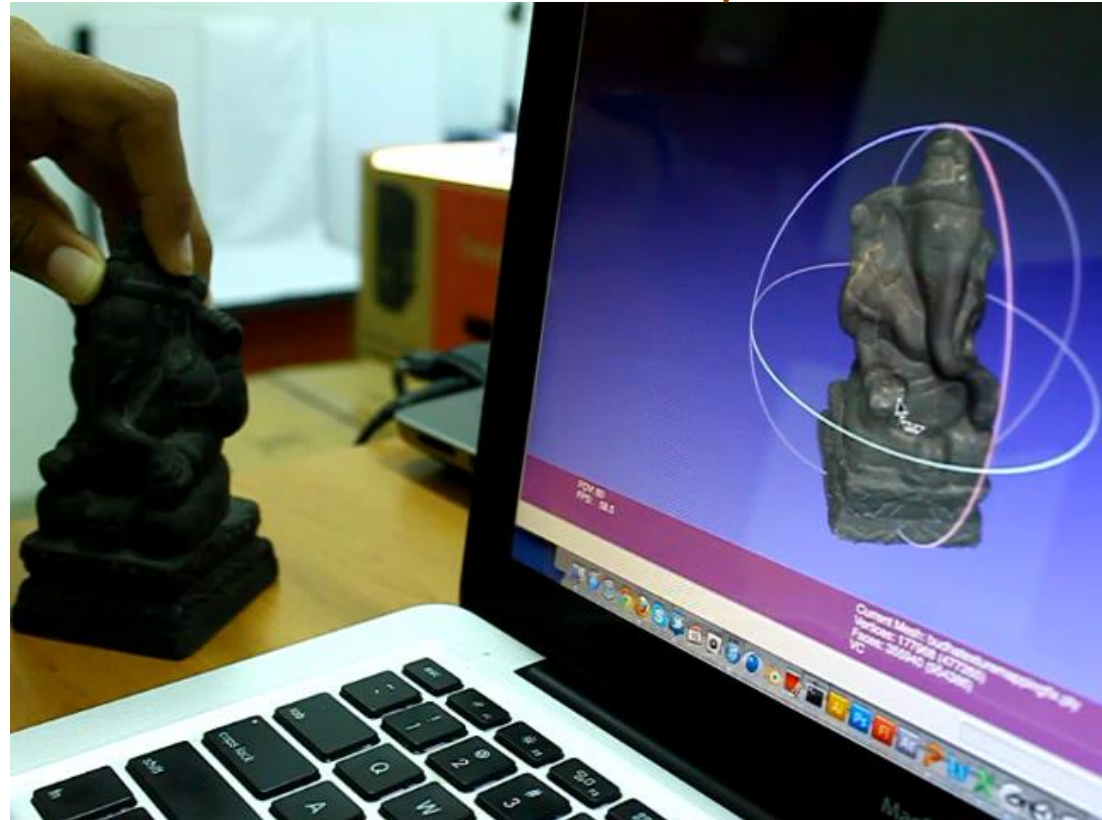
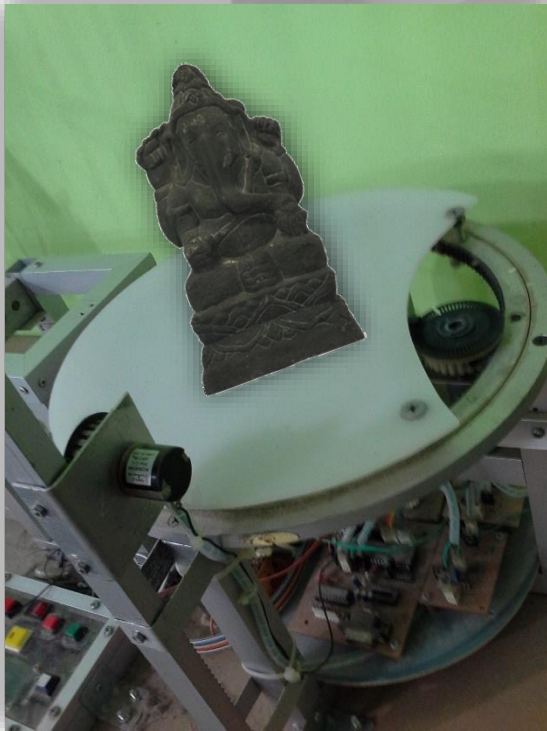


Congratulations, your item sold!

You successfully sold Moemiow - Barongsai Costume for 0.01 ETH on OpenSea.

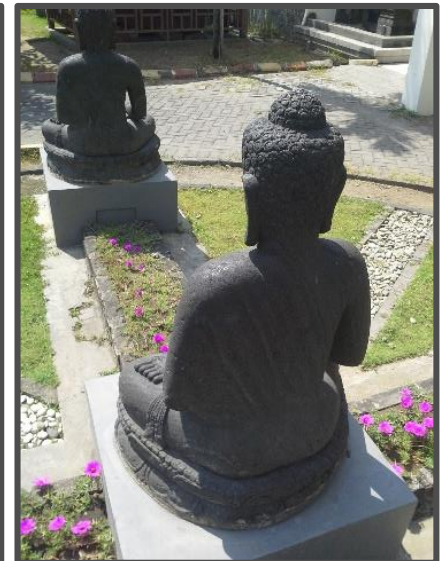
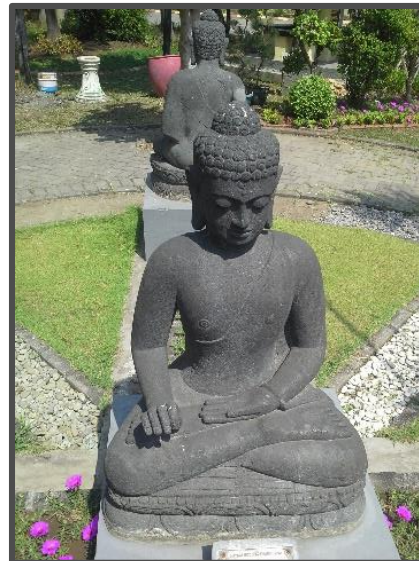


3D Scan Benda Berukuran Kecil



3D Reconstruction using Photogrammetry (or 3D Scanner)

- ❑ Easier and now increasingly popular
- ❑ Pictures of cultural heritage object are taken from different angles, processed using 3D Reconstruction Algorithm (Software)
- ❑ After completion, 3D Object can be edited, finalized



Contoh Model 3D dari 123D Catch: Patung Budha (Ukuran Medium)

video



3D Reconstruction

Borobodur Temple



Gate



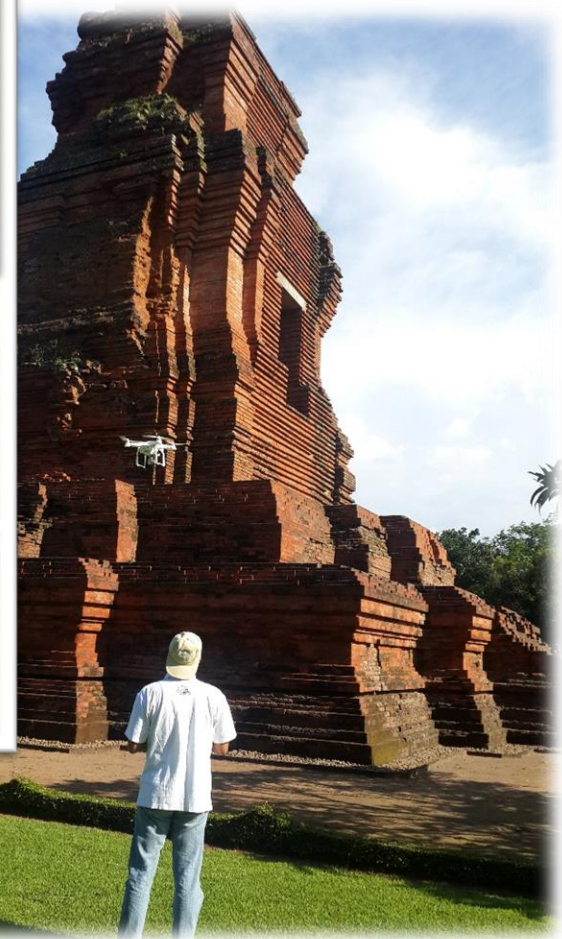
Life-size



miniature

- ## 3D Acquisition
- ❑ Small object
 - ❑ Medium object
 - ❑ Big object
 - ❑ Mega structure

Rekonstruksi 3D dengan Drone



3D Reconstruction using Drone



video

Interaksi VR dengan Custom Sensor (Device)

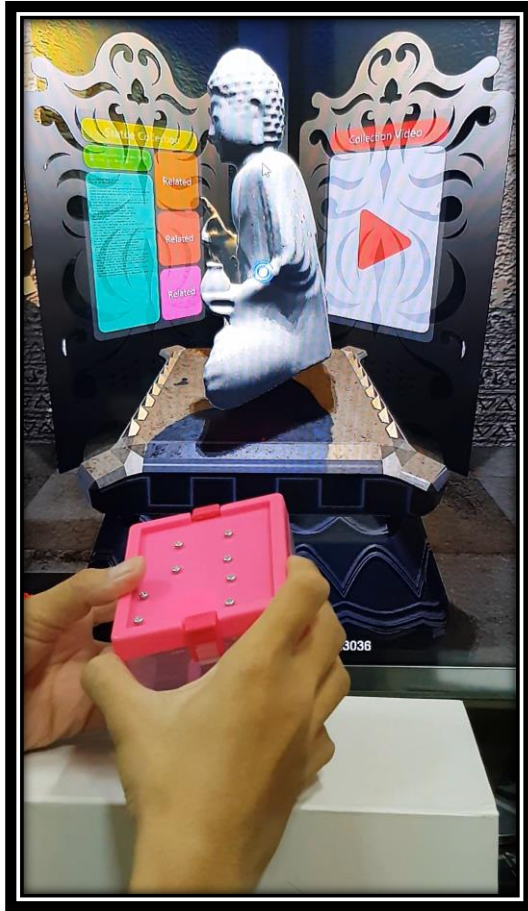


Pintu Ajaib Magic Door (Iphone)

Virtual Reality vs Fisik



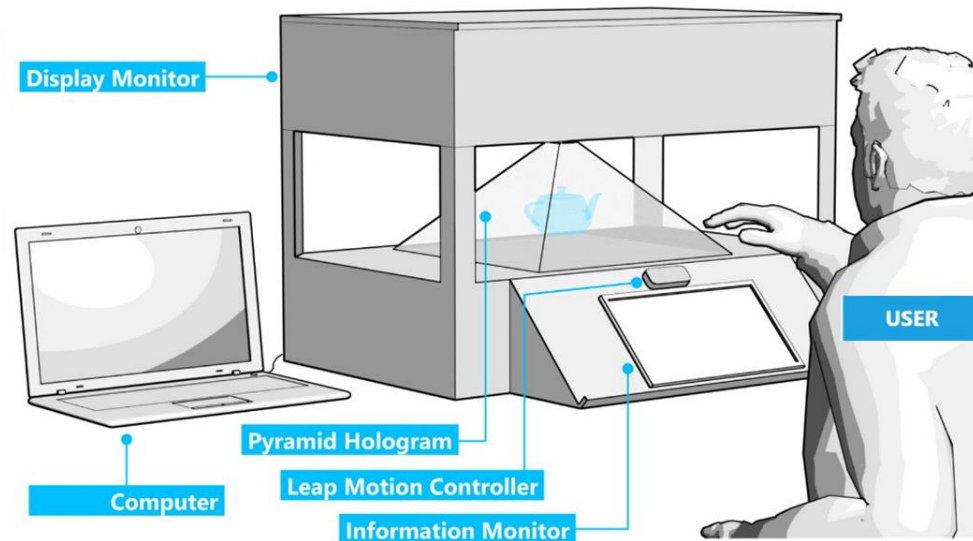
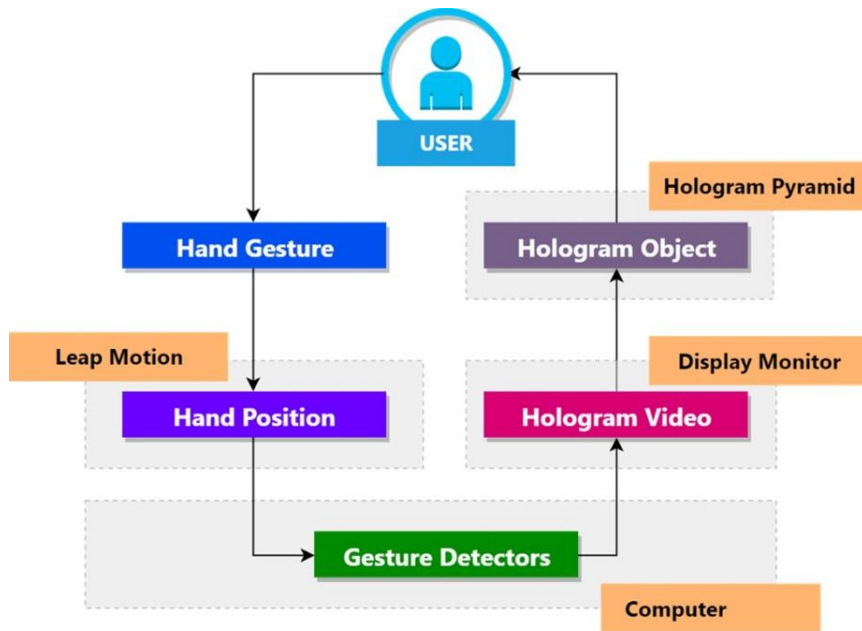
Prototype 3D Mouse Controller

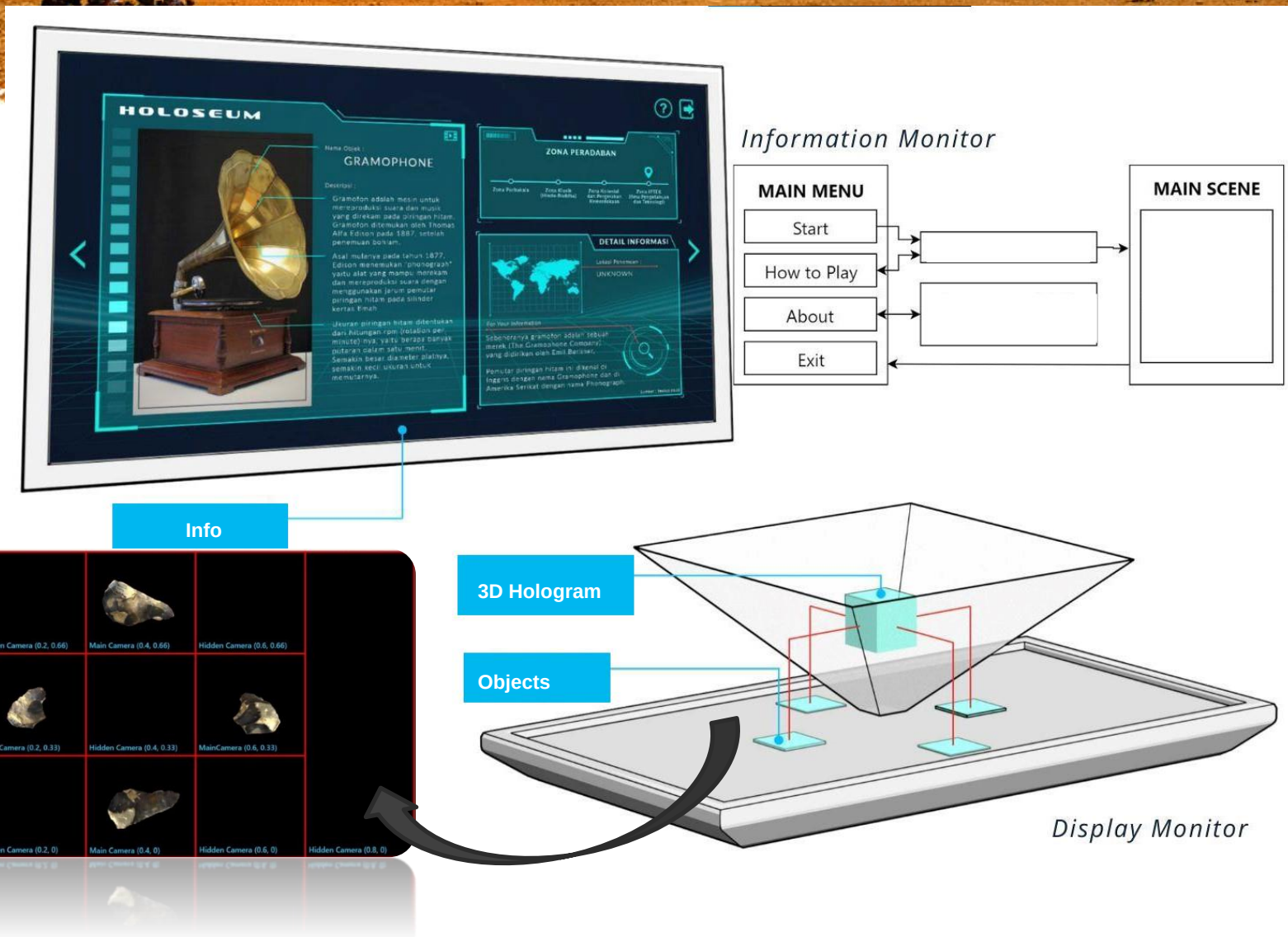


Music Box Simulator dengan "Real Experience" (E-Symphonion)

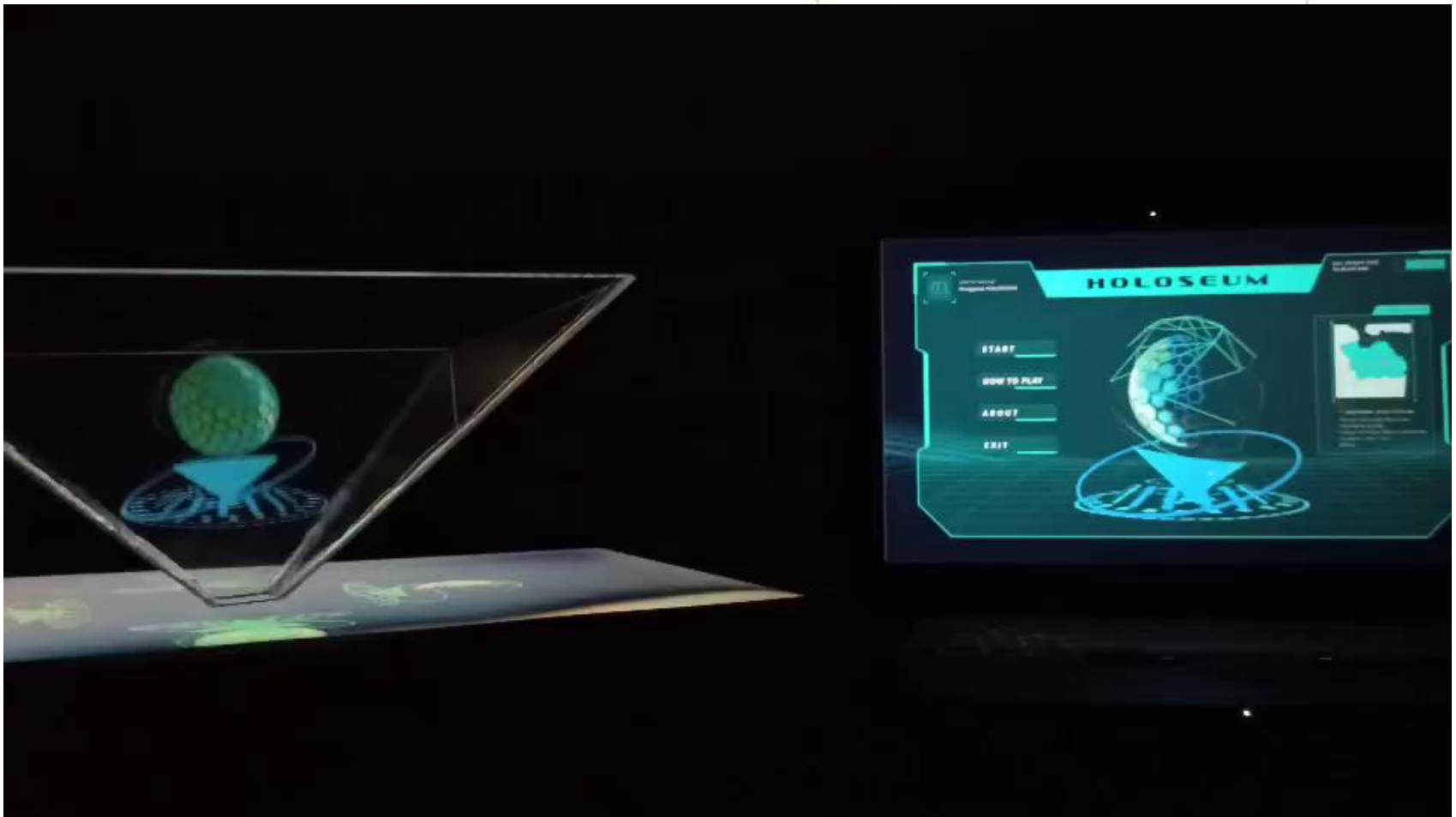


INTERACTIVE 3D HOLOGRAPHIC SYSTEM: design

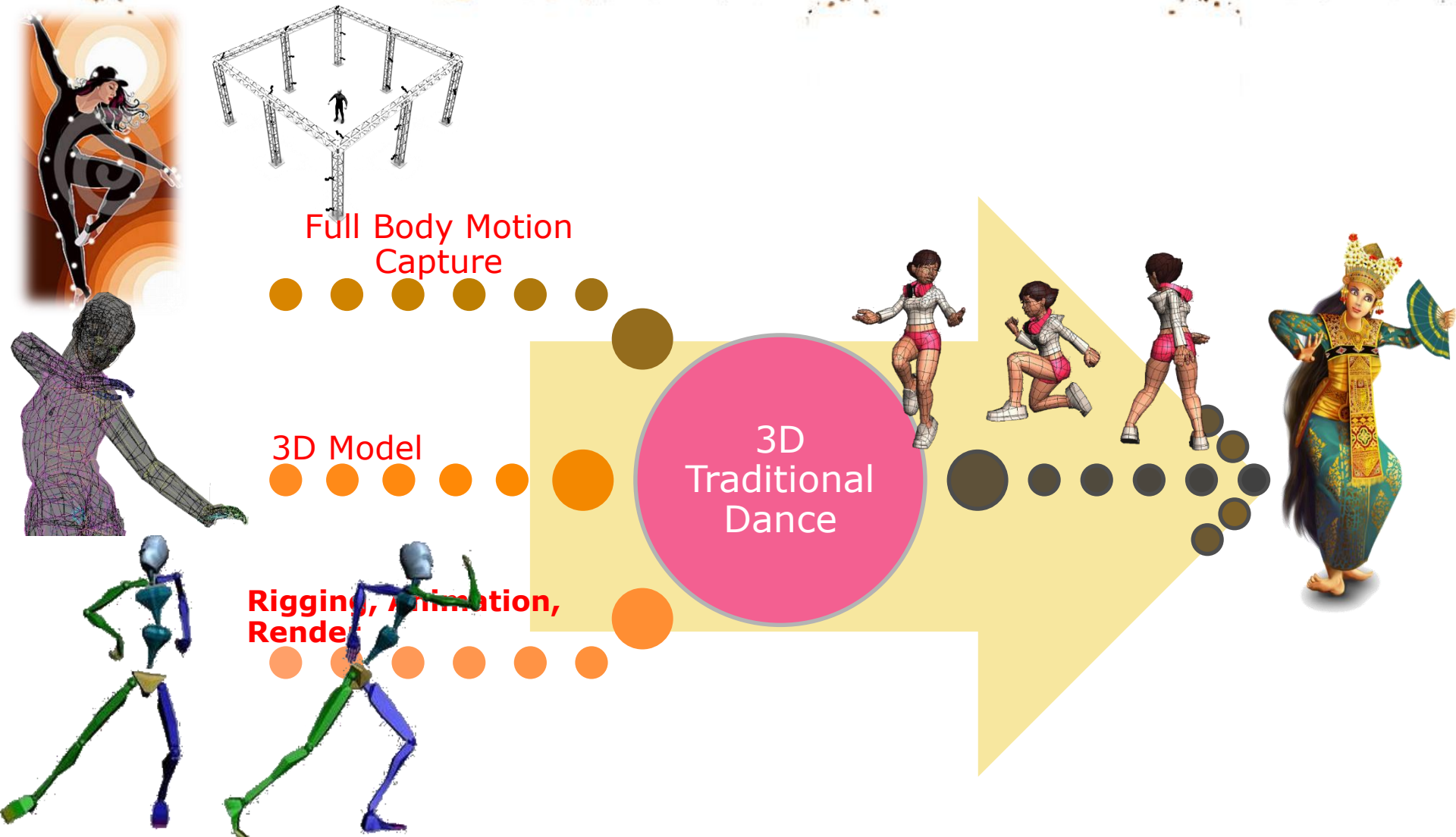




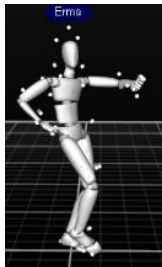
Holografi 3D Interaksi Hand Gesture



Intangible Cultural Heritage Traditional Dance Reconstruction

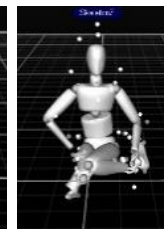
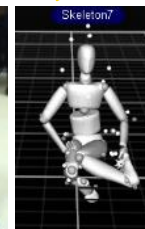


3D Presentation of Intangible Cultural Heritage: Traditional Dance

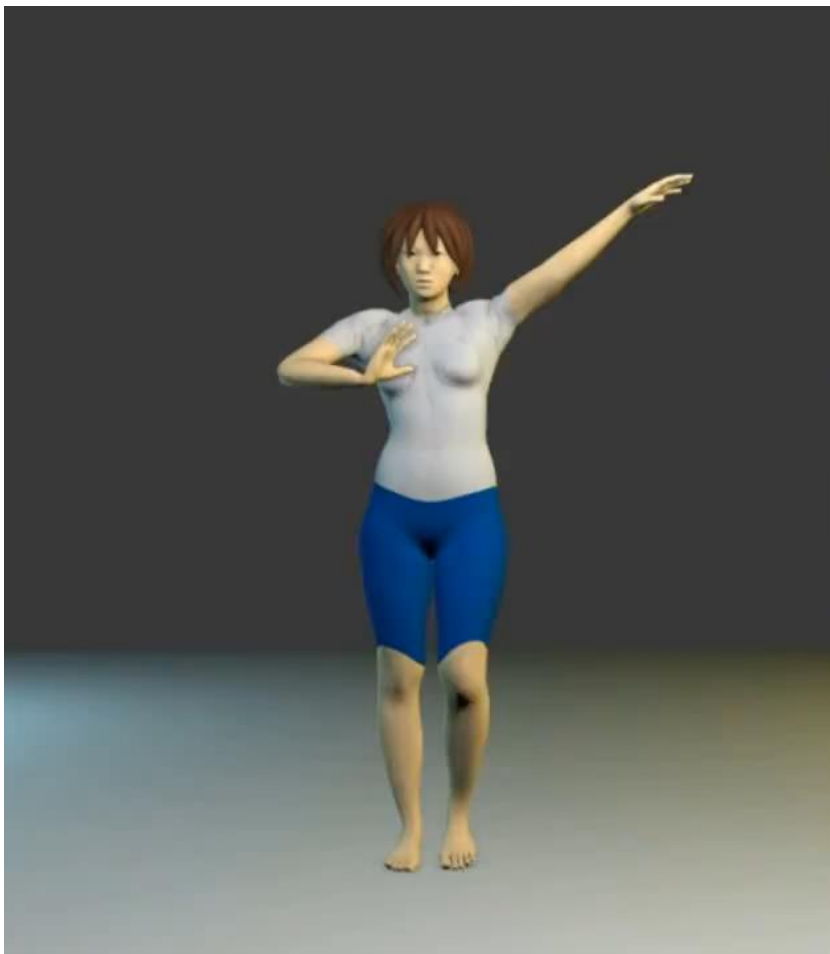


- ❖ 3D Full Body Motion Capture
- ❖ 3D Model
- ❖ Animation
- ❖ Rendering

video



3D Dance Reconstruction/Presentation using Motion Capture



video

TERIMA KASIH

TERIMA KASIH

